

Definitions and Concepts for OCR Computer Science A-level

Component 2.2: Problem Solving and Programming

2.2.1 Programming Techniques

Branching: A programming control structure where the code selects one or more alternative paths depending on the evaluation of a boolean expression.

Functions: A subroutine that can be called to perform a task or calculation and always return a value. Functions can be called in an expression, or be assigned to a variable.

Global Variables: A variable declared in the main program which exists outside any of the subroutines, but can be used anywhere in the program.

Integrated Development Environment (IDE): A software package that allows a user to develop and implement code more easily, with features for editing, debugging, version control, testing and compilation.

Iterations: A programming control structure where a set of statements is repeated either a fixed number of times or until a condition is met.

Local Variables: A variable declared within a subroutine of a program, which only exists and can be used within that subroutine.

Modularity: The technique of breaking down a complex problem into simpler, self-contained components called modules, where each module is an implementation of a specific subtask required to solve a problem.

Object Oriented Programming: A programming paradigm where the system is viewed as a set of objects, each with their own data (attributes) and procedures (methods), that can interact with each other. All processing is done by objects.

Parameter passing by reference: Passing the address or pointer of the required value into a procedure.

Parameter passing by value: Creating a temporary local copy of the actual value of a variable and passing it into the procedure.

Parameters: The data structures required to be passed into a subroutine.

Procedures: A subroutine that is called by simply writing its name in the code. Procedures do not have to return a value in the program.

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Recursion: A programming subroutine where a section of code calls itself until a base case is met. The base case must be chosen to avoid any possibility of an infinite loop.

Sequences: A programming control structure in which statements are executed one after another as they appear in the script.

Subroutines: A uniquely named section of code that is written to perform a specific task within a program.

2.2.2 Computational Methods

Backtracking: An algorithm that incrementally finds a solution by methodically trying different sequences and abandoning a path when it knows it cannot lead to a valid solution.

Computable Problems: A problem for which every instance can be solved in a finite number of steps by means of algorithm.

Computational Methods: A method of solving a problem which by some form of computation in devising and implementing an algorithm.

Data Mining: An algorithm that finds a solution by analysing a large data sets to uncover trends and relationships between variables.

Divide and Conquer: An algorithm design technique to decompose and solve problems by reducing the problem size with each iteration, until the sub problem becomes solvable.

Heuristics: A 'rule of thumb' algorithm which can produce a valid albeit sub-optimal solution for a hard (intractable) problem as an approximation.

Performance Modelling: The process of simulating the behaviour of a model under different virtual user and system loads by mathematical approximation.

Pipelining: The process of splitting a task into parts and then searching for subtasks that can be processed simultaneously to overlap the processing of each part.

Problem Decomposition: The process of splitting a given problem into smaller, solvable sub-problems that are easier to conceive, understand, maintain and program.

Problem Recognition: The ability to recognise the most effective strategy to solve a problem.

Visualisation: The use of a visual representation of an algorithm or data structure to translate a problem and its solution to a more human readable form.

